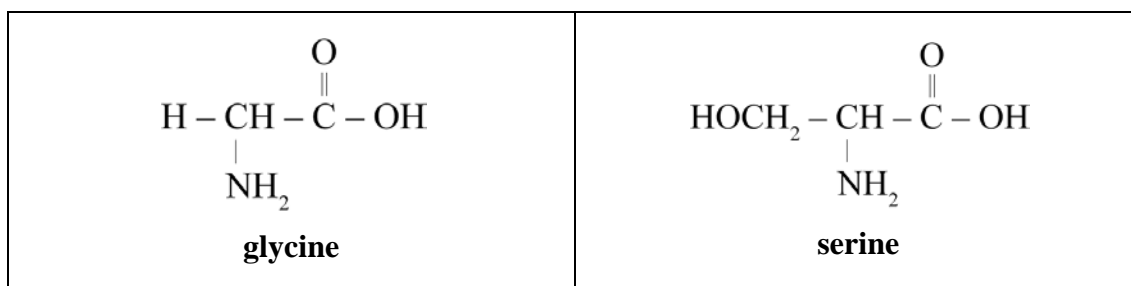


Amides and amino acids

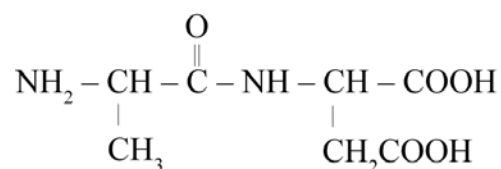
1) a) Glycine and serine are two amino acids, which can combine to form dipeptides.



i) Draw the structure(s) of the possible dipeptide(s) formed from a combination of glycine and serine.

ii) Explain your answer in terms of the structure and functional groups present in the amino acids and in the dipeptide(s).

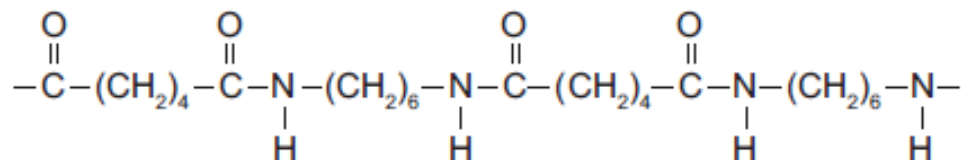
b) Determine the products of hydrolysis of the molecule shown below in BOTH acidic and basic conditions. Justify your answer in terms of structure and reactivity.



2) a) Give equations for the reactions of ethanamide when hydrolysed under acidic and basic conditions.

b) The haloalkane 1-chlorobutane can be used to make butanamide. One of the intermediate products is a carboxylic acid. Show, using structural formulae, how this might be achieved in a number of reaction steps. Include all reagents.

3) Nylon 6,6 is a polymer with the following structure:



Circle an amide linkage in the structure above.

4)

$\begin{array}{c} \text{O} \\ \\ \text{FH}_2\text{C}-\text{C} \\ \\ \text{OH} \end{array}$	$\begin{array}{c} \text{O} \\ \\ \text{H}_3\text{C}-\text{CH}_2-\text{C} \\ \\ \text{Cl} \end{array}$
$\text{H}_3\text{C}-\text{CH}_2-\text{CH}_2-\text{CH}_2-\text{Br}$	$\begin{array}{c} \text{H}_3\text{C}-\text{C}-\text{CH}_2-\text{CH}_2-\text{CH}_2-\text{CH}_3 \\ \\ \text{O} \end{array}$

i) Using a compound from the table above write an equation to show the formation of an amide.

ii) Using another compound from the table above write an equation to show the formation of an amine.

iii) Describe a test that could distinguish between the two organic products produced in reactions (i) and (ii).

5) Amino acids are the building blocks that make up proteins. Alanine and valine are amino acids which can combine to form dipeptides.

$\begin{array}{c} \text{O} \\ \\ \text{H}_3\text{C}-\text{CH}-\text{C}-\text{OH} \\ \\ \text{NH}_2 \end{array}$ <p>alanine</p>	$\begin{array}{c} \text{CH}_3 & \text{O} \\ & \\ \text{H}_3\text{C}-\text{CH}-\text{CH}-\text{C}-\text{OH} \\ \\ \text{NH}_2 \end{array}$ <p>valine</p>
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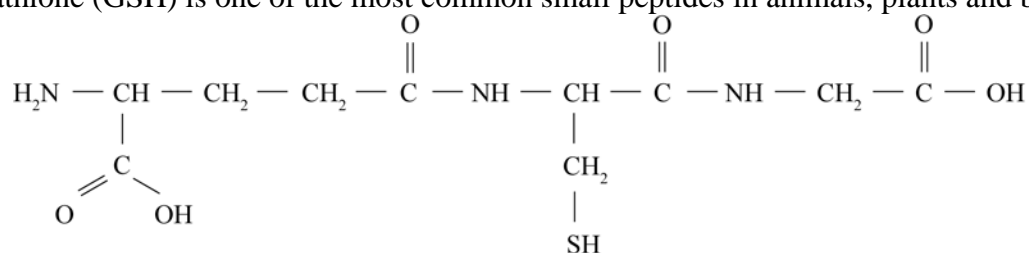
a) Draw the structure of a possible dipeptide formed from the combination of alanine and valine.

b) Draw the organic products of the hydrolysis of the dipeptide below using :

i) dilute hydrochloric acid solution

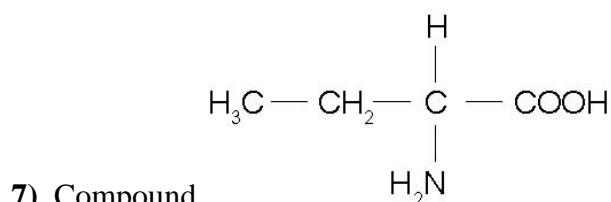
ii) dilute sodium hydroxide solution.

6) a) Glutathione (GSH) is one of the most common small peptides in animals, plants and bacteria.

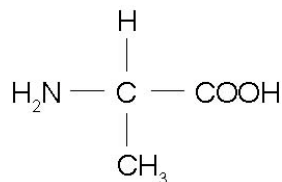


i) Draw a circle around one of the amide (peptide) groups.

ii) Draw structures of the products of the hydrolysis of this compound using alkaline conditions (NaOH) **and** compare with the structures of the hydrolysis products under acidic conditions.



undergoes a condensation reaction with the following



molecule (commonly referred to as alanine). It forms two different organic products referred to as dipeptides.

i) Draw the structural formulae for the two possible dipeptides.

ii) Explain why the formation of dipeptides is referred to as a ‘**condensation reaction**’.